

### **REMARKS**

Claims 1, 6-15, 21-26 and 31-33 are now pending in the application. Claims 1, 6-15, 21-26 and 31-33 stand rejected. Claims 2-5, 16-20 and 27-30 are cancelled.

The Examiner is respectfully requested to reconsider and withdraw the rejections in view of the amendments and remarks contained herein.

### **REJECTION UNDER 35 U.S.C. § 103**

1. Claims 1, 6, 7 and 9-14 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Few et al. (U.S. Pat. No. 5,404,712) in view of Bussing (U.S. Pat. No. 6,062,018).

As amended, Claim 1 recites, "A device for optically establishing a combustive reaction with a slurry fuel and air mixture, said device comprising: an optical energy source for generating an optical signal for interacting with the slurry fuel and air mixture to create a combustive reaction; at least one combustion chamber containing the slurry fuel and air mixture therewithin; a transfer device for optically interconnecting said optical energy source with said combustion chamber; and an intensity profiler for modifying the optical signal to have a high peak power at a leading edge of the optical signal for igniting the slurry fuel and air mixture to initiate the combustive reaction and a lower peak power during a remainder of the optical signal to maintain the combustive reaction of the slurry fuel and air mixture after the ignition."

Applicants respectfully submit that neither Few et al. nor Bussing describe, show or suggest a device for optically establishing a combustive reaction with a slurry fuel and air mixture having the limitations recited in amended Claim 1. For example, neither Few et al. nor Bussing describe, show or suggest a device for optically establishing a combustive reaction with a slurry fuel and air mixture that includes an intensity profiler for modifying an optical signal to have a high peak power at a leading edge for igniting the slurry fuel and air mixture to initiate the combustive reaction and a lower peak power during a remainder of the optical signal to maintain the combustive reaction. Rather, Few et al. describes a method and apparatus for igniting an air/fuel spray (26) comprised of fuel droplets. The apparatus includes a coherent optical source (12) for introducing at least one pulse of coherent radiation into the air/fuel spray. The pulse

generates free electrons and initiates a development of a plasma within the air/fuel spray. The pulse is terminated at a time after the plasma has reached a predetermined energy and *before ignition* of the air/fuel spray.

Bussing describes a pulse detonation power generation with a detonation chamber connected to fuel and air sources which detonate to produce energy which may be converted to electrical energy. The pulse detonation energy generator may have one or more detonation chambers, a fuel manifold, an air manifold, a pre-mixer, and a predetonator for initiating detonation in said detonation chambers. The system may be used to combust fuels such as: coal, coal slurry, natural gas and other liquid hydrocarbons. Thus, neither Few et al. nor Bussing describe, show or suggest the device for optically establishing a combustive reaction with a slurry fuel and air mixture recited in amended Claim 1.

Therefore, for at least the reasons set forth above, Applicants respectfully submit that amended Claim 1 is patentable over Few et al. in view of Bussing. Claims 6, 7 and 9-14 depend from amended Claim 1. When the recitations of Claim 6, 7 and 9-14 are considered in combination with the recitations of amended Claim 1, Applicants submit that Claims 6, 7 and 9-14 are likewise patentable over Fuss et al. in view of Bussing.

For the reasons set forth above, Applicants respectfully request that the §103 of Claims 1, 6, 7 and 9-14 be withdrawn.

2. Claim 8 stands rejected under 35 U.S.C. § 103(a) as being unpatentable over Few et al. (U.S. Pat. No. 5,404,712) in view of Bussing (U.S. Pat. No. 6,062,018) and further in view of Firnberg et al. (U.S. Pat. No. 5,374,405).

Claim 8 depends from amended Claim 1, which, in accordance with the remarks set forth above, Applicant respectfully submits is patentable over the cited references, Few et al in view of Bussing. Thus, when the recitations of Claim 8 are considered in combination with the recitations of amended Claim 1, Applicants submit that Claim 8 is patentable over Few et al. in view of Bussing and further in view of Firnberg et al.

For the reasons set forth above, Applicants respectfully request that the §103 of Claim 8 be withdrawn.

3. Claims 15 and 21-25 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Few et al. (U.S. Pat. No. 5,404,712) in view of Bussing (U.S. Pat. No. 6,062,018) and further in view of Hunt et al. (U.S. Pat. No. 6,385,963).

As amended, Claim 15 recites, "A device for optically establishing a combustive reaction with a slurry fuel and air mixture, said device comprising: at least one combustion chamber containing the slurry fuel and air mixture therewithin; an optical energy source adapted to generate an optical signal for interacting with the slurry fuel and air mixture to create a combustive reaction; a optical fiber for optically interconnecting said optical energy source with said combustion chamber; and an optical wavelength filter adapted to filter said optical signal such that residual light having wavelengths longer than a specified length is removed; and an intensity profiler for modifying the optical signal to have a high peak power at a leading edge of the optical signal for igniting the slurry fuel and air mixture to initiate the combustive reaction and a lower peak power during a remainder of the optical signal to maintain the combustive reaction of the slurry fuel and air mixture after the ignition."

Applicants respectfully submit that neither Few et al., Bussing nor Hunt et al. describe, show or suggest a device for optically establishing a combustive reaction with a slurry fuel and air mixture having the limitations recited in amended Claim 15. For example, neither Few et al., Bussing nor Hunt et al. describe, show or suggest a device for optically establishing a combustive reaction with a slurry fuel and air mixture that includes an intensity profiler for modifying an optical signal to have a high peak power at a leading edge for igniting the slurry fuel and air mixture to initiate the combustive reaction and a lower peak power during a remainder of the optical signal to maintain the combustive reaction.

As set forth above neither Few et al. nor Bussing describe, show or suggest the device for optically establishing a combustive reaction with a slurry fuel and air mixture recited in amended 15. Furthermore, Hunt et al. describes an optical system including an optical source capable of producing light having physical characteristics sufficient for optically driven chemical disassociation of a fuel. The system also includes an optical delivery system for providing optical delivery of light from the optical source to a chemical fuel source. The optical system is used for a propulsion producing engine

having a chemical fuel source. The endothermic fuel generation is produced by the non-linear, optical interaction of the produced light with the fuel, thereby leading to molecular dissociation of the fuel. Thus, neither Few et al., Bussing nor Hunt et al. describe, show or suggest the device for optically establishing a combustive reaction with a slurry fuel and air mixture recited in amended Claim 15.

Therefore, for at least the reasons set forth above, Applicants respectfully submit that amended Claim 15 is patentable over Few et al. in view of Bussing and Hunt et al. Claims 21-25 depend from amended Claim 15. When the recitations of Claim 21-25 are considered in combination with the recitations of amended Claim 15, Applicants submit that Claims 21-25 are likewise patentable over Fuss et al. in view of Bussing and Hunt et al.

For the reasons set forth above, Applicants respectfully request that the §103 of Claims 15 and 21-25 be withdrawn.

4. Claims 26 and 31-33 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Few et al. (U.S. Pat. No. 5,404,712) in view of Bussing (U.S. Pat. No. 6,062,018) and further in view of Nishida et al. (Japan 57-200672).

As amended, Claim 26 recites, "A device for optically establishing a combustive reaction with a slurry fuel and air mixture, said device comprising: at least one combustion chamber containing the slurry fuel and air mixture therewithin; a laser energy source adapted to generate an optical signal for interacting with the slurry fuel and air mixture to create a combustive reaction; an optical fiber for optically interconnecting said optical energy source with said combustion chamber; an optical wavelength filter adapted to filter said optical signal such that residual light having wavelengths longer than a specified length is removed; and an intensity profiler adapted to modify said optical signal to have a high peak power at a leading edge of the optical signal for igniting the slurry fuel and air mixture to initiate the combustive reaction and a lower peak power during a remainder of the optical signal to maintain the combustive reaction of the slurry fuel and air mixture after the ignition."

Applicants respectfully submit that neither Few et al., Bussing nor Nishida et al. describe, show or suggest a device for optically establishing a combustive reaction with a slurry fuel and air mixture having the limitations recited in amended Claim 26. For

example, neither Few et al., Bussing nor Nishida et al. describe, show or suggest a device for optically establishing a combustive reaction with a slurry fuel and air mixture that includes an intensity profiler for modifying an optical signal to have a high peak power at a leading edge for igniting the slurry fuel and air mixture to initiate the combustive reaction and a lower peak power during a remainder of the optical signal to maintain the combustive reaction.

As set forth above neither Few et al. nor Bussing describe, show or suggest the device for optically establishing a combustive reaction with a slurry fuel and air mixture recited in amended 15. Furthermore, Nishida et al. describes a laser oscillator 3 that produces laser oscillation in response to an output signal of an ignition controlling circuit 2. The ignition controlling circuit consists of an ignition timing calculation circuit 21 for calculating the ignition timing and a laser controlling circuit 22 for controlling the laser oscillation synchronously with the ignition timing. Laser beams 6a controlled into parallel beams by a beam expander 4 form a focus F in a combustion chamber by means of a condensing lens 51. Here, *laser beams are emitted at least twice*. That is, dielectric breakdown of mixture is caused by *a first shot of laser beams* having a high energy density, thus producing a high-temperature and high-density plasma serving as pilot fire for igniting ambient mixture. Then, *a second laser beams* having a low energy density is given and its energy is absorbed by the previously produce plasma, so that mixture can be ignited in a reliable manner.

Thus, neither Few et al., Bussing nor Nishida et al. describe, show or suggest the device for optically establishing a combustive reaction with a slurry fuel and air mixture including an intensity profiler for modifying an optical signal to have a high peak power at a leading edge for igniting a slurry fuel and air mixture, thereby initiating the combustive reaction, and a lower peak power during a remainder of the optical signal to maintain the combustive reaction, as recited in amended Claim 26.

Therefore, for at least the reasons set forth above, Applicants respectfully submit that amended Claim 26 is patentable over Few et al. in view of Bussing and Nishida et al. Claims 31-33 depend from amended Claim 26. When the recitations of Claim 31-33 are considered in combination with the recitations of amended Claim 26, Applicants

submit that Claims 31-33 are likewise patentable over Fuss et al. in view of Bussing and Nishida et al.

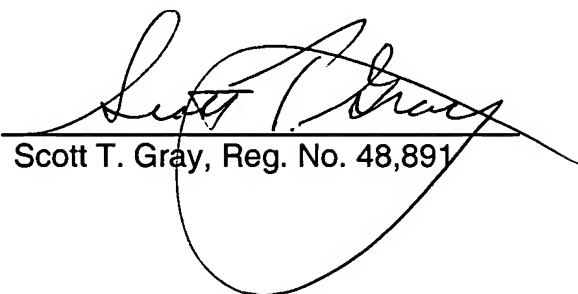
For the reasons set forth above, Applicants respectfully request that the §103 of Claims 26 and 31-33 be withdrawn.

**CONCLUSION**

It is believed that all of the stated grounds of rejection have been properly traversed, accommodated or rendered moot. Applicants therefore respectfully request that the Examiner reconsider and withdraw all presently outstanding rejections. It is believed that a full and complete response has been made to the outstanding Office Action and, as such, the present application is in condition for allowance. Thus, prompt and favorable consideration of this amendment is respectfully requested. If the Examiner believes that personal communication will expedite prosecution of this application, the Examiner is invited to telephone the undersigned at (248) 641-1600.

Respectfully submitted,

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